UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/696,276	10/29/2003	Nicolas B. Cobb	MEGC121783	6511

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EXAMINER
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ART UNIT	PAPER NUMBER
2123	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

	Application No.	Applicant(s)
Office Action Summary	10/696,276	COBB, NICOLAS B.
	Examiner	Art Unit	
	Juan C. Ochoa	2123	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
 Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *12 February 2007*.

2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-3,5-8,12 and 13* is/are pending in the application.

    4a) Of the above claim(s) *6,7 and 13* is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-3,5,8 and 12* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on *12 February 2007* is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
   Paper No(s)/Mail Date *2/12/07* .

4) ☐ Interview Summary (PTO-413)
   Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____ .

DETAILED ACTION

1.   The amendment filed 2/12/07 has been received and considered. Claims 1–3, 5–

8, 12, and 13 are pending in this application, claims 6, 7, and 13 have been withdrawn.

Claims 4 and 9–11 are cancelled. Claims 1–3, 5, 8, and 12 are presented for

examination.

Information Disclosure Statement

2.   The information disclosure statement filed 2/12/07 lists NPL "Mathematical and

CAD framework for proximity correction". This information referred to has not been

considered since such NPL had been considered already. Examiner was enquiring

about Cites O12 and O13, not O3.

3.   The information disclosure statement filed 2/9/04 contains a large number of

references, and some of them miss–referenced, submitted for consideration that appear

to be cumulative and are consistent with the progress in the art. In view of the number

of references in this application, the Applicant is requested to identify any specific

references, features, sections or figures in the references cited which are believed to

have particular significance in the prosecution of this application or which are

considered material to the patentability of the pending claims, for further consideration

by the Examiner.

Drawings

4.   The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5)

because:

5.   As to Figure 11A, it does not include the following reference sign(s) mentioned in

the description: 1000.

6.   Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to

the specification to add the reference character(s) in the description in compliance with

37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the

application. Any amended replacement drawing sheet should include all of the figures

appearing on the immediate prior version of the sheet, even if only one figure is being

amended. Each drawing sheet submitted after the filing date of an application must be

labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37

CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be

notified and informed of any required corrective action in the next Office action. The

objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

7.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

8.   The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1.   Determining the scope and contents of the prior art.
2.   Ascertaining the differences between the prior art and the claims at issue.
3.   Resolving the level of ordinary skill in the pertinent art.
4.   Considering objective evidence present in the application indicating
        obviousness or nonobviousness.

9.   Claims 1–3, 5, 8, and 12 are rejected under 35 U.S.C. § 103(a) as being

unpatentable over Mukherjee, Maharaj (Mukherjee hereinafter), U.S. Patent 6,649,309,

taken in view of Cobb and Zakhor (Cobb/Zakhor hereinafter), Fast, Low-Complexity

Mask Design.

10.   As to claim 1, Mukherjee discloses a method of preparing circuit layout data for

the application of optical and process correction (OPC) (see col. 2, lines 40–41),

comprising: receiving data that represents a layer of an integrated circuit that is defined

as a number of polygons (see col. 7, lines 1–2 and Fig. 9, 1st item); fragmenting a

polygon into a number of edge segments by defining a number of fragmentation

endpoints that extend around the perimeter of the polygon (see col. 7, lines 1–7);

defining control sites for the edge segments (see "control points" in col. 7, lines 9–14);

computing a simulation of the layout that estimates light intensity values in an area

corresponding to a control site of at least one of the edge segments (see col. 6, lines

42–43 and "alternatively run aerial image simulation" in Fig. 4, 2nd item); calculating a

curvature of the light intensity to the at least one edge segment (see col. 2, lines 46–

47); and using the curvature of the light intensity to adjust the number of fragmentation

endpoints on the perimeter of the polygon (see col. 2, lines 47–49).

11.   Mukherjee does not disclose expressly simulation of the layout that estimates

light intensity.

12.   Official notice is taken that simulation of the layout that estimates light intensity

was well known at the time the invention was made in the analogous art of Aleshin et

al., (Aleshin hereinafter), U.S. Patent 6,263,299. (See col. 5, lines 10–11).

13.   At the time the invention was made, it would have been obvious to a person of

ordinary skill in the art to modify "run aerial image simulation" as "simulation of the

layout that estimates light intensity".

14.   The suggestion/motivation to do so would have been to replace all the sides or

vertices of each shape on the mask having a high radius of curvature with mask

patterns having a smaller radius of curvature (see col. 2, lines 33–35).

15.   Therefore, it would have been obvious to modify Mukherjee to obtain the

invention as specified in claims.

16.   While Mukherjee discloses almost all of the instant invention, Mukherjee fails to

disclose calculating a curvature of the light intensity in a direction parallel to the at least

one edge segment at the control site.

17.   Cobb/Zakhor discloses calculating a curvature of the light intensity in a direction

parallel to the at least one edge segment at the control site. (See page 315, Section

2.2, lines 4–11).

18.   Mukherjee and Cobb/Zakhor are analogous art because they are both related to

OPC.

19.   Therefore, it would have been obvious to one of ordinary skill in this art at the

time of invention by applicant to utilize the step of Cobb/Zakhor in the method of

Mukherjee because Cobb/Zakhor utilizes his OPC algorithm, which is suitable for

correcting phase-assigned masks (see page 323, Section 6, lines 1–3), and as a result,

Cobb/Zakhor reports the following improvements over his prior art: a significant

algorithm speedup implementing a fast intensity computation with lookup tables for

upper right corner rectangle basis functions and applications of his fast intensity

computation such as fast aerial image simulation if combined with sparse sampling

techniques (see page 323, Section 6, lines 3–7).

20.   As to claim 2, Cobb/Zakhor discloses a method wherein the number of

fragmentation endpoints is adjusted by: adding one or more fragmentation endpoints to

a polygon if the curvature of the light intensity calculated at a position corresponding to

a control site for an edge segment is greater than a predetermined threshold. (See "A

set of K sample points, or control points, $S = \{x_j : 1 < j < K\}$ is then chosen at which to

optimize the function" in page 315, Section 2.2, lines 5–6).

21.   As to claim 3, Cobb/Zakhor discloses a method wherein the number of

fragmentation endpoints is adjusted by: calculating a curvature of the light intensity at a

position corresponding to the control site and in a direction parallel to an adjacent edge

segment (see page 315, Section 2.2, lines 4–11); and removing one or more

fragmentation endpoints from the perimeter of the polygon if the curvature of the light

intensity calculated at a position of the control sites defined for adjacent edge segments

is less than a predetermined threshold (see "A set of K sample points, or control points,

$S = \{x_j : 1 < j < K\}$ is then chosen at which to optimize the function" in page 315, Section

2.2, lines 5–6).

22.   As to claim 5, Mukherjee discloses a computer storage medium including a

sequence of program instructions recorded thereon that, when executed by one or more

processors, cause the one or more processors to implement the method of any of

claims 1-4. (See col. 9, lines 7–13).

23.   As to claim 8, Mukherjee discloses a method for preparing data that describes a layout of an integrated circuit (see col. 2, lines 40–41) by: fragmenting polygons that describe structures to be created via photolithography (see col. 2, lines 42–44); performing an initial fragmentation that divides a polygon into a number of edge segments that extend around the perimeter of the polygon (see col. 2, lines 60–62); defining control sites for the edge segments (see "control points" in col. 7, lines 9–14); computing a simulation of a curvature of an image intensity under defined process conditions (see col. 6, lines 42–43 and "alternatively run aerial image simulation" in Fig. 4, 2nd item); and using the results of the simulation to adjust the fragmentation of the polygon (see col. 2, lines 47–49) to add fragmentation endpoints in areas where the curvature of the image intensity is greater than a predetermined amount and/or to remove fragmentation endpoints where the curvature of the image intensity is less than a predetermined amount (see col. 6, lines 46–49). While Mukherjee discloses almost all of the instant invention, Mukherjee fails to disclose computing a simulation of a curvature of an image intensity at a location on a wafer corresponding to a control site in a direction parallel to an edge segment. Cobb/Zakhor discloses calculating a curvature of the light intensity in a direction parallel to the at least one edge segment at the control site. (See page 315, Section 2.2, lines 4–11).

24.   As to claim 12, Mukherjee discloses a computer storage medium that stores a sequence of program instructions that when executed by one or more computers cause the one or more computers to implement the method of any of claims 8-11. (See col. 9, lines 7–13).

Response to Arguments

25.   Applicant's arguments filed 2/12/07 have been fully considered but they are not persuasive.

26.   Regarding the drawing objections, one deficiency remains, all previous objections withdrawn.

27.   Regarding the specification objections, the amendment corrected all deficiencies and the objections are withdrawn.

28.   Regarding the IDS objections. Deficiencies remain:

29.   Applicant was non–responsive. Applicant failed to identify specific references, features, sections or figures in the references cited believed to have particular significance in the prosecution of this application or which are considered material to the patentability of the pending claims. Additionally, as for the references submitted on 2/9/04, Examiner found some of them as unrelated to the limitations set forth in the instant application.

30.   The information disclosure statement filed 2/9/04 listed a table of contents as Cite O12 "SPIE Proceedings, 19th Annual Symposium on Photomask Technology 3873.21, Editors: Abboud, F. et al., 1999". Examiner was enquiring about the particular significance of a Proceedings' table of contents to the patentability of the pending claims.

31.   The information disclosure statement filed 2/9/04 listed a table of contents as Cite O13 "SPIE Proceedings, Optical Microlithography LY2726: 15, Editors: Fuller, G.E. et al., 1996". This information referred to has not been considered. Examiner was

enquiring about the particular significance of a Proceedings' table of contents to the

patentability of the pending claims.

32.   Regarding the rejections under 101, the amendment corrected all deficiencies

and the rejections are withdrawn. The claimed "computer storage medium" is

interpreted to exclude the disclosed "transmission medium".

33.   Regarding the rejections under 102 and 103. Applicant's arguments with respect

to claims have been considered but are moot in view of the new ground(s) of rejection.

In the instant rejection, Examiner has elaborated prior art disclosures of amended

claims.

Conclusion

34.   Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

35.   A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the date of this final action.

36.   Examiner would like to point out that any reference to specific figures, columns

and lines should not be considered limiting in any way, the entire reference is

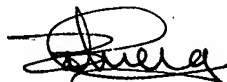considered to provide disclosure relating to the claimed invention.

37.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Juan C. Ochoa whose telephone number is (571) 272-

2625. The examiner can normally be reached on 7:30AM - 4:00 PM.

38.   If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Paul Rodriguez can be reached on (571) 272-3753. The fax phone number

for the organization where this application or proceeding is assigned is 571-273-8300.

39.   Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

*** _JJO_ 5/7/07

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5/10/07